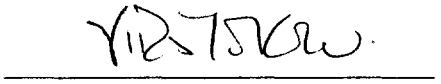
Statistically Analyzing the Short Term Profit of Basic Strategy, Multi-deck, Strip Blackjack

An Honors Thesis (HONRS 499)

by

Adam E. Coolman



Dr. Giray Okten

Ball State University

Muncie, IN

April 2002

May 4, 2002

Abstract

After playing a given number of blackjack hands, actual earnings results vary, sometimes drastically, from theoretical results. The enclosed, user friendly, computer program simulates a user-entered number of blackjack hands (1-10000), calculates expected profit, standard deviation, confidence intervals about the sample mean, and probability of profit. The statistical breakdown gives the user a detailed description of the short-term blackjack earning potential any player will want to view before hitting the multi-deck tables on the Las Vegas Strip.

This thesis paper delves into the many intricacies of the computer simulation and statistical analysis processes such as blackjack rules on the Strip, basic strategy, and confidence interval analysis. In addition, using included sample results, conclusions are made on the relationship between actual and theoretical results, distribution of earnings per hand, effect of short-term simulation on confidence intervals, probability of profit, and effects of playing blackjack via basic strategy, forms of card counting, or an inferior method.

Acknowledgements

Best regards to Dr. Giray Okten for his mentoring, patience, and persistence. Throughout the rigorous computer programming, simulation testing, and conclusion making process he made sure I didn't stray from the correct path and helped me fight through each roadblock along the way.

Table of Contents

I. Statistically Analyzing the Short Term Earnings of Basic Strategy, Multi-deck, Strip Blackjack

Blackjack players, regardless of skill level, would pay big money to know their expected earnings per hand. The mathematically inclined blackjack player knows that unless seemingly infinite hands are played, such figures cannot be computed exactly. A non-infinite amount of trials will produce variable expected earnings. For a finite number of trials, sample expected earnings and standard deviation have a direct impact on the probability of profiting from playing blackjack. This thesis demonstrates how a blackjack program I have developed determines, via short-term simulation, sample expected earnings and standard deviation for a hand of blackjack and uses that data to statistically analyze the short-term expected profitability and variability of playing blackjack using basic strategy.

In his book, Winning Casino Blackjack for the Non-counter, world-renowned gambler Avery Cardoza describes blackjack as a game where every decision affects a player's percentage against the house. (117) A player's percentage against the house is their expected profit per unit wagered. Today's blackjack player is ultimately concerned about maximizing this percentage. For the non-cardcounter, this maximization is done using basic strategy.

In today's technological era, the average blackjack player is one who is well versed in basic strategy. Basic strategy outlines the simulation-tested, profit-maximizing action that should be taken for every possible player total - dealer upcard circumstance. Of the two initial cards received by the dealer, the upcard is the card that can be seen by every player while the hole card is concealed until all players have finished playing their hands. The correct basic

strategy action is determined by using conditional probabilities to compute the expected profit of every possible action a player may take.

Depending on the composition of a player's cards and the dealer's upcard, the player may have the opportunity to take any of the following actions on the hand: hit (take an additional card), stand (take no further action on the hand), surrender, double, split, or take insurance. Surrender allows a player to forfeit half his wager, a 1-2 payoff, and fold his hand before any other action is taken. Doubling permits the player to double his initial bet after receiving the first two cards. For doubling the bet, the player is forced to take one additional card and stand. Splitting can be done when a player's initial two cards are the same value. All face cards and tens are considered the same value. A player may place an equivalent bet, split the equal cards, and play two separate hands with each card of similar value becoming the first card of the new hands. Insurance, paying 2-1, is an option a player has when the dealer's upcard is an ace. If the player takes insurance, a side bet of up to one-half the original bet is made betting the dealer has a blackjack. Winning an insurance bet of one-half the original bet is a wash for the player.

Out of every possible player action, the one producing the largest expected profit, in the long run, is deemed the correct basic strategy play for the tested player total – dealer upcard circumstance. After every possible circumstance is tested, a complete basic strategy is formed. The complete basic strategy, outlined in table form in Section II, reduces the house advantage to its non-card counting minimum. Blackjack hands in my program use basic strategy to dictate the way each blackjack hand is managed.

Basic strategy has its share of downfalls as well. As a memory-less approach to blackjack, basic strategy limits its expected profits. Conditional probabilities for basic strategy are calculated based on a full deck. Each hand is believed to have equivalent profit expectation.

In reality, profit-maximizing plays for a full deck may deviate as the distribution of the remaining cards changes. For example, basic strategy fails to account for the fact that "some card combinations which have the same total, but unlike compositions, require a different action to optimize expectation." (Griffin, 17) In addition, by assuming each hand has equivalent expectation, the basic strategist sees no reason to vary his neutral bet between hands.

The fallacies of basic strategy lead to The Fundamental Theorem of Card Counting, stating, "variations in player expectation for a fixed strategy become increasingly spread out as the deck is depleted." (Griffin, 22) As the distribution of the deck changes, card counters deviate from basic strategy accordingly. The card counter takes advantage of bet minimization or maximization by deviating from the neutral bet in relationship to the inherent favorable or unfavorable characteristics of the underlying distribution of the remaining cards.

Standard blackjack rules give players the opportunity to hit, stand, split pairs, double down, and take insurance. Regular and double down wins pay 2-1, blackjacks 3-2, insurance 2-1, and pushes 1-1. Casinos implement these basic rules and payoffs but also add their own mix of restrictions on when doubling down or splitting is allowed. In addition, surrender, a 1-2 payout, is now becoming an increasingly popular non-standard option many casinos allow. Dealers are required to hit until the total of their hand is greater than 16, at which point they are required to stand. However, depending on house rules, the casino may rule that the dealer must hit a soft 17, any total of 17 including an ace.

Las Vegas Strip multiple deck blackjack rules follow the basic standards, with a few adjustments. Strip rules permit the player to split non-ace pairs up to three times, making four total hands. Aces may only be split once with each ace being given only one additional card. When aces are split, any resulting A-10 combination is considered a straight 21 rather than a

blackjack. Doubling is allowed on any two-card combination and is allowed after splitting. Insurance is allowed but is never an option when using basic strategy because it is not the optimal play in any circumstance. The Strip uses a shoe of six decks and the dealer must stand on all totals of 17 or above, whether soft or hard. Section II contains basic strategy tables for the Las Vegas Strip multiple deck blackjack rules used in the simulation program. (Silberstang, 91) Section III contains the strategy table dealers must use on the Strip.

As stated earlier, basic strategy is calculated using probabilities based on a full deck and the player assumes equal profit expectation on each hand. Factors such as the number of players at a table, burning a card, shoe penetration, and using a new shoe to finish a previous shoe do not affect the strategy of the player and are not factored into the simulation. Burning a card is an action taken by the dealer when a new shoe begins or when a new dealer takes over. This action requires the dealer to take the next playable card out of play. In order to deter card counters and prevent unfinished hands, dealers reshuffle after a certain percentage of the cards have been played. Shoe penetration defines the percentage of cards from the original shoe actually dealt for play.

Long run expected profit per hand, using basic strategy, has been accurately calculated to the ten-thousandths. Kenneth Smith's "Blackjack Basic Strategy Engine," and Eric Farmer's "Basic Strategy Calculator" produce long run expected casino profit per hand of .0036 (.36%) and .0033 (.33%) respectively when applying the Las Vegas Strip rules. These figures represent the theoretical loss per hand a player expects to duplicate in the long run.

Duplicating the amount of trials used to compute these long run expected values would be impossible for an individual to complete in a lifetime, let alone one session of game play. Blackjack players everywhere deal with this all-too-real fact every time they sit down to play. In

the short-run, the house advantage can vary immensely from the theoretical advantage. Sample statistical results from five simulations of 25, 50, 100, 200, 500, 1000, 2500, 5000, and 10,000 trials can be found in Section IV. My simulations yielded profits ranging from -.46 to .27 per hand, a far cry from the theoretical value of -.0033 or -.0036. The long run house advantage is of minor importance to the short-run player. The short-run player is concerned about the edge they are experiencing, the standard deviation of per hand earnings, and ultimately how these deviations affect the probability of profiting from playing a given number of hands. The standard deviation of expected earnings is a measure of how dispersed the data are from the sample mean. (Hogg, 14)

Blackjack is a game where long run simulation will not mirror short-term reality. Since replicating theoretical expectation and deviation consistently is impossible in the short-run, confidence intervals become the key analytical tool when examining expected returns over a series of achievable trials. Using basic strategy, my computer program simulates a user-entered number of blackjack hands (1-10000) and calculates the expected profit per hand, its standard deviation, and both normal and Student's-t confidence intervals surrounding expected earnings. For 1-200 simulations a bootstrap-t confidence interval is also calculated. For a stated level of confidence, confidence intervals form bounds around the sample mean and enclose all values that can be expected with the stated confidence level. The resulting bootstrap-t, normal, and Student's-t confidence intervals give the user insight into the variability of short-term expected earnings.

"Through the use of bootstrapping, accurate intervals can be obtained without having to make assumptions about the underlying distribution." (Efron, 160) This method is particularly useful when the application of the Central Limit Theorem, the support behind the normal

approximation, is suspect due to the small number of trials. Bootstrapping forms an idea about the underlying distribution by constructing a given number of bootstrap samples. Bootstrap samples are computed by sampling the empirical distribution with replacement. Each bootstrap sample is then standardized like the normal distribution and the standardization of each re-sampling is sorted and used in confidence interval analysis.

As trials and bootstrap samples increased, my results showed the bootstrap characteristics begin to approach those of the normal and Student's-t distribution. The average bootstrapping interval for the five sets of 100 trials in Section IV was off 5.44 and 6.70% from the average normal and Student's-t distribution, respectively. For the five sets of 200, those numbers lowered to 4.26% and 4.90%. Increasing the bootstrapping samples further would have likely continued the convergence toward establishing the normal or Student's-t distribution as the correct underlying distribution. Meanwhile, as the sample standard deviation begins to approach the theoretical standard deviation, by way of increased trials, the Student's-t distribution points more and more to the normal distribution as an accurate distribution of expected profit per hand. Therefore, in my program, the probability of profit calculation is made assuming the sample standard deviation is equal to the theoretical deviation, whereby the normal distribution is the best approximation for the distribution of expected earnings.

The confidence intervals produced by the computer program summarize expected profit per session. They are calculated by multiplying the confidence interval bounds for the expected profit per hand by the number of hands played in the session. The base earnings per session confidence interval is calculated using a neutral bet of one. Calculating confidence intervals for other neutral bets requires nothing other than multiplying the base interval bounds by the neutral

bet amount. The computer program outputs the base confidence interval as well as confidence intervals for neutral bets of 5, 10, 25, 50, and 100.

The simulation program as a whole has the capabilities to show the power of multiple trials. As trials decrease, confidence intervals and probability of profit calculations become increasingly dependent on the sample expected earnings and standard deviation. The results from the five simulations of 25 and 50 hands show the power increasing the number of trials has on confidence analysis. The expected earnings intervals for both sessions are nearly the same despite playing an additional 25 hands. Earlier we stated that the approximate theoretical profit per hand is between -. 0033 and -. 0036, yet 10,000 trials is not enough to confidently close in on the theoretical mean. The confidence intervals generated by the computer program can be easily transformed into expected earnings per hand confidence intervals. This conversion is done by dividing each interval bound by the number of hands per session. Using this conversion, my results show that expected earnings per hand over 10,000 hands have maximum upper and lower bounds of approximately -.04 and .06, a range of .1. They also show that the average 99% interval size for the five results of 25 trials is 1.28 while for 10,000 trials it is .057. As trials increase, the variability of expected results lessens and the base confidence intervals increasingly close in on the theoretical mean.

Results from simulations show the vast impact decreasing the house edge via forms of card counting has on profit probability and confidence intervals. If a player was able to maintain an advantage on the house of 3% over 10,000 trials, then according to my results and assuming a similar sample standard deviation, the player can be 99% sure of a profit anywhere between $20 and $590. On the other hand, a player who plays without either using basic strategy or counting cards has the potential to increase the house edge and experience lower expected profit and less

pleasant confidence intervals. Playing 1,000 hand poor enough to give the house an edge of 8.3% will result in losses between $2 and $163 with 98% confidence.

The realization that theoretical results cannot be consistently achieved over the short-term gives the basic strategist hope of profitable short-term sessions. In theory, the expected loss per hand would be duplicated consistently and result in a 0% chance of profit. However, playing between 25-10,000 hands provides the basic strategist enough variability from the theoretical results to enjoy profitable sessions. Keep in mind however, for a basic strategist the occurrence of a profitable session is less likely then a losing one.

This thesis paper and enclosed computer program effectively provide the short-term blackjack player insight into the realm of earnings possibilities. The scope of such insight is directly proportional to the number of trials and dependent on the sample mean and standard deviation. The next time someone plans on playing blackjack, they should run my computer program a couple times to get a grasp of what earnings variability awaits them.

Works Cited

Cardoza, Avery Winning Casino Blackjack for the Non-counter. New York: Cardoza Publishing, 1999.

Cooper, Carl, and Lance Humble The World's Greatest Blackjack Book. New York: Doubleday, 1987.

Efron, Bradley, and Robert J. Tibshirani. An Introduction to the Bootstrap. New York: Chapman & Hall, 1993.

Farmer, Eric. "Blackjack Game and Basic Strategy Calculator." 2001. Internet. 15 Apr. 2002

Griffin, Peter A. The Theory of Blackjack. Las Vegas: Huntington Press, 1999.

Hogg, Robert V., and Elliot A. Tanis. Probability and Statistical Inference. Upper Saddle River: Prentice Hall

Silberstang, Edwin Winning Blackjack for the Serious Player. New York: Cardoza Publishing, 1998.

Smith, Kenneth. "Blackjack Basic Strategy Engine." 2002. Internet. 10 Apr. 2002

Section II

H = hit S = stand X = surrender P = split D = double

Basic Strategy (First Two Cards)

	2	3	4	5	6	7	8	9	10	A
4	H	H	H	H	H	H	H	H	H	H
5	H	H	H	H	H	H	H	H	H	H
6	H	H	H	H	H	H	H	H	H	H
7	H	H	H	H	H	H	H	H	H	H
8	H	H	H	H	H	H	H	H	H	H
9	H	D	D	D	D	H	H	H	H	H
10	D	D	D	D	D	D	D	D	H	H
11	D	D	D	D	D	D	D	D	D	H
12	H	H	S	S	S	H	H	H	H	H
13	S	S	S	S	S	H	H	H	H	H
14	S	S	S	S	S	H	H	H	H	H
15	S	S	S	S	S	H	H	H	X	H
16	S	S	S	S	S	H	H	X	X	X
17	S	S	S	S	S	S	S	S	S	S
18	S	S	S	S	S	S	S	S	S	S
19	S	S	S	S	S	S	S	S	S	S
20	S	S	S	S	S	S	S	S	S	S
A2	H	H	H	D	D	H	H	H	H	H
A3	H	H	H	D	D	H	H	H	H	H
A4	H	H	D	D	D	H	H	H	H	H
A5	H	H	D	D	D	H	H	H	H	H
A6	H	D	D	D	D	H	H	H	H	H
A7	S	D	D	D	D	S	S	H	H	H
A8	S	S	S	S	S	S	S	S	S	S
A9	S	S	S	S	S	S	S	S	S	S
A10	S	S	S	S	S	S	S	S	S	S
22	P	P	P	P	P	P	H	H	H	H
33	P	P	P	P	P	P	H	H	H	H
44	H	H	H	P	P	H	H	H	H	H
55	H	H	H	H	H	H	H	H	H	H
66	P	P	P	P	P	H	H	H	H	H
77	P	P	P	P	P	P	H	H	H	H
88	P	P	P	P	P	P	P	P	P	P
99	P	P	P	P	P	S	P	P	S	S
1010	S	S	S	S	S	S	S	S	S	S
AA	P	P	P	P	P	P	P	P	P	P

Basic Strategy (Three or more Cards)

	2	3	4	5	6	7	8	9	10	A
5	H	H	H	H	H	H	H	H	H	H
6	H	H	H	H	H	H	H	H	H	H
7	H	H	H	H	H	H	H	H	H	H
8	H	H	H	H	H	H	H	H	H	H
9	H	H	H	H	H	H	H	H	H	H
10	H	H	H	H	H	H	H	H	H	H
11	H	H	H	H	H	H	H	H	H	H
12	H	H	S	S	S	H	H	H	H	H
13	S	S	S	S	S	H	H	H	H	H
14	S	S	S	S	S	H	H	H	H	H
15	S	S	S	S	S	H	H	H	H	H
16	S	S	S	S	S	H	H	H	H	H
17	S	S	S	S	S	S	S	S	S	S
18	S	S	S	S	S	S	S	S	S	S
19	S	S	S	S	S	S	S	S	S	S
20	S	S	S	S	S	S	S	S	S	S
21	S	S	S	S	S	S	S	S	S	S
A1	H	H	H	H	H	H	H	H	H	H
A2	H	H	H	H	H	H	H	H	H	H
A3	H	H	H	H	H	H	H	H	H	H
A4	H	H	H	H	H	H	H	H	H	H
A5	H	H	H	H	H	H	H	H	H	H
A6	H	H	H	H	H	H	H	H	H	H
A7	S	H	H	H	H	S	S	H	H	H
A8	S	S	S	S	S	S	S	S	S	S
A9	S	S	S	S	S	S	S	S	S	S
A10	S	S	S	S	S	S	S	S	S	S

Section III

Dealer Strategy	
Dealer Total	Action
4	H
5	H
6	H
7	H
8	H
9	H
10	H
11	H
12	H
13	H
14	H
15	H
16	H
17	S
18	S
19	S
20	S
21	S
A1	H
A2	H
A3	H
A4	H
A5	H
A6	S
A7	S
A8	S
A9	S
A10	S

H = hit
S = stand

Section IV

a

Hands Played	25

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.4600)	(11.5000)
SD[Profit]	0.9566	4.7826

Probability of Profit	0.61%

Bootstrapping (200 samples)

Confidence Intervals	Bet = 1	
99%	(22.03)	6.58
98%	(20.34)	5.24
97%	(19.77)	4.00
96%	(19.54)	0.33
95%	(19.22)	(0.29)
90%	(17.35)	(2.24)
75%	(15.45)	(6.01)
50%	(13.81)	(8.53)

Normal Distribution

Confidence Intervals	Bet = 1	
99%	(23.82)	0.82
98%	(22.63)	(0.37)
97%	(21.88)	(1.12)
96%	(21.32)	(1.68)
95%	(20.87)	(2.13)
90%	(19.37)	(3.63)
75%	(17.00)	(6.00)
50%	(14.73)	(8.27)

Student's t Distribution

Confidence Intervals	Bet = 1	
99%	(24.88)	1.88
98%	(23.42)	0.42
97%	(22.53)	(0.47)
96%	(21.89)	(1.11)
95%	(21.37)	(1.63)
90%	(19.68)	(3.32)
75%	(17.14)	(5.86)
50%	(14.78)	(8.22)

Hands Played	25

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.3400)	(8.5000)
SD[Profit]	1.2138	6.0690

Probability of Profit	5.07%

Confidence Intervals	Bet = 1	
99%	(21.66)	12.67
98%	(20.25)	10.96
97%	(20.13)	9.35
96%	(20.10)	7.70
95%	(19.05)	7.70
90%	(16.96)	3.66
75%	(15.15)	(0.52)
50%	(12.07)	(3.63)

Confidence Intervals	Bet = 1	
99%	(24.13)	7.13
98%	(22.62)	5.62
97%	(21.67)	4.67
96%	(20.96)	3.96
95%	(20.40)	3.40
90%	(18.48)	1.48
75%	(15.48)	(1.52)
50%	(12.59)	(4.41)

Confidence Intervals	Bet = 1	
99%	(25.47)	8.47
98%	(23.63)	6.63
97%	(22.50)	5.50
96%	(21.68)	4.68
95%	(21.03)	4.03
90%	(18.88)	1.88
75%	(15.65)	(1.35)
50%	(12.66)	(4.34)

Hands Played	25

Profit Analysis	Per Hand	Per Session
E[Profit]	-	-
SD[Profit]	1.0704	5.3522

Probability of Profit	50.00%

Confidence Intervals	Bet = 1	
99%	(14.17)	13.83
98%	(14.17)	12.54
97%	(11.95)	12.50
96%	(10.84)	11.78
95%	(9.34)	11.39
90%	(8.37)	8.20
75%	(5.76)	6.14
50%	(3.08)	4.13

Confidence Intervals	Bet = 1	
99%	(13.79)	13.79
98%	(12.45)	12.45
97%	(11.61)	11.61
96%	(10.99)	10.99
95%	(10.49)	10.49
90%	(8.80)	8.80
75%	(6.16)	6.16
50%	(3.61)	3.61

Confidence Intervals	Bet = 1	
99%	(14.97)	14.97
98%	(13.34)	13.34
97%	(12.35)	12.35
96%	(11.62)	11.62
95%	(11.05)	11.05
90%	(9.16)	9.16
75%	(6.31)	6.31
50%	(3.67)	3.67

Hands Played	25

Profit Analysis	Per Hand	Per Session
E[Profit]	0.0400	1.0000
SD[Profit]	1.1630	5.8149

Probability of Profit	58.83%

Confidence Intervals	Bet = 1	
99%	(11.50)	16.08
98%	(11.48)	15.01
97%	(10.69)	12.07
96%	(10.31)	11.81
95%	(10.21)	11.53
90%	(8.47)	9.77
75%	(4.86)	7.29
50%	(2.40)	4.45

Confidence Intervals	Bet = 1	
99%	(13.98)	15.98
98%	(12.53)	14.53
97%	(11.62)	13.62
96%	(10.94)	12.94
95%	(10.40)	12.40
90%	(8.56)	10.56
75%	(5.69)	7.69
50%	(2.92)	4.92

Confidence Intervals	Bet = 1	
99%	(15.26)	17.26
98%	(13.49)	15.49
97%	(12.41)	14.41
96%	(11.63)	13.63
95%	(11.00)	13.00
90%	(8.95)	10.95
75%	(5.86)	7.86
50%	(2.96)	4.96

Hands Played	25

Profit Analysis	Per Hand	Per Session
E[Profit]	0.1000	2.5000
SD[Profit]	1.1990	5.9948

Probability of Profit	66.17%

Confidence Intervals	Bet = 1	
99%	(10.20)	21.70
98%	(9.50)	20.43
97%	(9.49)	18.59
96%	(9.02)	18.00
95%	(7.88)	16.94
90%	(7.16)	13.88
75%	(3.91)	11.14
50%	(1.79)	7.18

Confidence Intervals	Bet = 1	
99%	(12.94)	17.94
98%	(11.45)	16.45
97%	(10.51)	15.51
96%	(9.81)	14.81
95%	(9.25)	14.25
90%	(7.36)	12.36
75%	(4.40)	9.40
50%	(1.54)	6.54

Confidence Intervals	Bet = 1	
99%	(14.27)	19.27
98%	(12.44)	17.44
97%	(11.33)	16.33
96%	(10.52)	15.52
95%	(9.87)	14.87
90%	(7.76)	12.76
75%	(4.57)	9.57
50%	(1.61)	6.61

Section IV
b

Hands Played	50

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.3300)	(16.5000)
SD[Profit]	1.1048	7.8119

Probability of Profit	1.79%

Bootstrapping (200 samples)		
Confidence Intervals	Bet = 1	
99%	(32.78)	2.17
98%	(32.40)	1.24
97%	(32.33)	0.81
96%	(29.96)	0.62
95%	(29.92)	0.52
90%	(27.70)	(2.61)
75%	(24.84)	(7.83)
50%	(21.64)	(10.77)

Normal Distribution		
Confidence Intervals	Bet = 1	
99%	(36.62)	3.62
98%	(34.67)	1.67
97%	(33.45)	0.45
96%	(32.54)	(0.46)
95%	(31.81)	(1.19)
90%	(29.35)	(3.65)
75%	(25.49)	(7.51)
50%	(21.77)	(11.23)

Student's t Distribution		
Confidence Intervals	Bet = 1	
99%	(37.44)	4.44
98%	(35.29)	2.29
97%	(33.96)	0.96
96%	(32.98)	(0.02)
95%	(32.20)	(0.80)
90%	(29.60)	(3.40)
75%	(25.59)	(7.41)
50%	(21.81)	(11.19)

Hands Played	50

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.1300)	(6.5000)
SD[Profit]	1.1265	7.9799

Probability of Profit	20.77%

Confidence Intervals	Bet = 1	
99%	(24.10)	15.29
98%	(22.18)	11.03
97%	(22.12)	9.43
96%	(20.65)	7.56
95%	(20.48)	7.10
90%	(18.72)	5.13
75%	(15.60)	1.02
50%	(11.87)	(2.22)

Confidence Intervals	Bet = 1	
99%	(27.05)	14.05
98%	(25.06)	12.06
97%	(23.82)	10.82
96%	(22.89)	9.89
95%	(22.14)	9.14
90%	(19.63)	6.63
75%	(15.68)	2.68
50%	(11.88)	(1.12)

Confidence Intervals	Bet = 1	
99%	(27.89)	14.89
98%	(25.69)	12.69
97%	(24.34)	11.34
96%	(23.34)	10.34
95%	(22.54)	9.54
90%	(19.88)	6.88
75%	(15.79)	2.79
50%	(11.92)	(1.08)

Hands Played	50

Profit Analysis	Per Hand	Per Session
E[Profit]	-	-
SD[Profit]	1.0643	7.5255

Probability of Profit	50.00%

Confidence Intervals	Bet = 1	
99%	(19.06)	22.09
98%	(18.26)	21.39
97%	(16.55)	19.77
96%	(16.47)	18.53
95%	(14.02)	17.04
90%	(11.36)	13.99
75%	(8.06)	9.59
50%	(4.61)	6.54

Confidence Intervals	Bet = 1	
99%	(19.38)	19.38
98%	(17.51)	17.51
97%	(16.33)	16.33
96%	(15.46)	15.46
95%	(14.75)	14.75
90%	(12.38)	12.38
75%	(8.66)	8.66
50%	(5.08)	5.08

Confidence Intervals	Bet = 1	
99%	(20.17)	20.17
98%	(18.10)	18.10
97%	(16.82)	16.82
96%	(15.88)	15.88
95%	(15.12)	15.12
90%	(12.62)	12.62
75%	(8.76)	8.76
50%	(5.11)	5.11

Hands Played	50

Profit Analysis	Per Hand	Per Session
E[Profit]	0.1100	5.5000
SD[Profit]	1.0987	7.7687

Probability of Profit	76.05%

Confidence Intervals	Bet = 1	
99%	(14.53)	23.63
98%	(13.27)	22.80
97%	(8.55)	22.58
96%	(7.04)	22.58
95%	(6.09)	22.36
90%	(3.97)	19.16
75%	(0.97)	14.23
50%	1.53	10.22

Confidence Intervals	Bet = 1	
99%	(14.51)	25.51
98%	(12.57)	23.57
97%	(11.36)	22.36
96%	(10.45)	21.45
95%	(9.73)	20.73
90%	(7.28)	18.28
75%	(3.44)	14.44
50%	0.26	10.74

Confidence Intervals	Bet = 1	
99%	(15.32)	26.32
98%	(13.18)	24.18
97%	(11.86)	22.86
96%	(10.89)	21.89
95%	(10.11)	21.11
90%	(7.52)	18.52
75%	(3.54)	14.54
50%	0.22	10.78

Hands Played	50

Profit Analysis	Per Hand	Per Session
E[Profit]	0.2700	13.5000
SD[Profit]	1.0653	7.5326

Probability of Profit	96.35%

Confidence Intervals	Bet = 1	
99%	(10.12)	28.69
98%	(6.61)	27.46
97%	(2.56)	27.25
96%	(2.24)	26.03
95%	(2.13)	25.64
90%	0.12	24.15
75%	4.25	20.51
50%	8.61	17.97

Confidence Intervals	Bet = 1	
99%	(5.90)	32.90
98%	(4.02)	31.02
97%	(2.85)	29.85
96%	(1.97)	28.97
95%	(1.26)	28.26
90%	1.11	25.89
75%	4.83	22.17
50%	8.42	18.58

Confidence Intervals	Bet = 1	
99%	(6.69)	33.69
98%	(4.82)	31.82
97%	(3.34)	30.34
96%	(2.39)	29.39
95%	(1.64)	28.64
90%	0.87	26.13
75%	4.73	22.27
50%	8.38	18.62

Section IV
c

Hands Played	100

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.0330)	(3.3000)
SD[Profit]	1.1210	11.2101

Probability of Profit	38.45%

Bootstrapping (200 samples)		
Confidence Intervals	Bet = 1	
99%	(31.39)	22.56
98%	(29.79)	21.31
97%	(29.39)	18.49
96%	(22.85)	17.56
95%	(22.39)	17.52
90%	(19.46)	16.14
75%	(16.22)	9.36
50%	(10.81)	5.27

Normal Distribution		
Confidence Intervals	Bet = 1	
99%	(31.88)	25.88
98%	(29.08)	23.08
97%	(27.33)	21.33
96%	(26.02)	20.02
95%	(24.97)	18.97
90%	(21.44)	15.44
75%	(15.90)	9.90
50%	(10.56)	4.56

Student's t Distribution		
Confidence Intervals	Bet = 1	
99%	(32.44)	26.44
98%	(29.51)	23.51
97%	(27.68)	21.68
96%	(26.33)	20.33
95%	(25.24)	19.24
90%	(21.61)	15.61
75%	(15.97)	9.97
50%	(10.59)	4.59

Hands Played	100

Profit Analysis	Per Hand	Per Session
E[Profit]	0.0150	1.5000
SD[Profit]	1.0765	10.7651

Probability of Profit	56.54%

Bootstrapping (200 samples)		
Confidence Intervals	Bet = 1	
99%	(20.48)	27.27
98%	(19.55)	25.82
97%	(18.53)	23.50
96%	(18.23)	23.42
95%	(16.50)	21.96
90%	(15.04)	19.40
75%	(10.07)	15.16
50%	(6.37)	8.49

Normal Distribution		
Confidence Intervals	Bet = 1	
99%	(26.23)	29.23
98%	(23.54)	26.54
97%	(21.86)	24.86
96%	(20.61)	23.61
95%	(19.60)	22.60
90%	(16.21)	19.21
75%	(10.88)	13.88
50%	(5.76)	8.76

Student's t Distribution		
Confidence Intervals	Bet = 1	
99%	(26.77)	29.77
98%	(23.98)	26.96
97%	(22.20)	25.20
96%	(20.90)	23.90
95%	(19.86)	22.86
90%	(16.37)	19.37
75%	(10.98)	13.96
50%	(5.79)	8.79

Hands Played	100

Profit Analysis	Per Hand	Per Session
E[Profit]	0.0350	3.5000
SD[Profit]	1.0378	10.3781

Probability of Profit	63.20%

Bootstrapping (200 samples)		
Confidence Intervals	Bet = 1	
99%	(27.62)	29.25
98%	(20.00)	25.73
97%	(19.25)	24.74
96%	(19.02)	23.69
95%	(17.49)	22.92
90%	(15.17)	18.27
75%	(9.61)	15.30
50%	(5.15)	11.16

Normal Distribution		
Confidence Intervals	Bet = 1	
99%	(23.23)	30.23
98%	(20.64)	27.64
97%	(19.02)	26.02
96%	(17.81)	24.81
95%	(16.84)	23.84
90%	(13.57)	20.57
75%	(8.44)	15.44
50%	(3.50)	10.50

Student's t Distribution		
Confidence Intervals	Bet = 1	
99%	(23.76)	30.76
98%	(21.04)	28.04
97%	(19.35)	26.35
96%	(18.10)	25.10
95%	(17.09)	24.09
90%	(13.73)	20.73
75%	(8.51)	15.51
50%	(3.53)	10.53

Hands Played	100

Profit Analysis	Per Hand	Per Session
E[Profit]	0.0750	7.5000
SD[Profit]	1.1621	11.6206

Probability of Profit	74.07%

Bootstrapping (200 samples)		
Confidence Intervals	Bet = 1	
99%	(20.17)	36.78
98%	(19.26)	33.69
97%	(19.02)	31.30
96%	(16.68)	30.24
95%	(15.35)	29.91
90%	(10.99)	24.30
75%	(4.14)	19.70
50%	1.22	13.93

Normal Distribution		
Confidence Intervals	Bet = 1	
99%	(22.43)	37.43
98%	(19.53)	34.53
97%	(17.72)	32.72
96%	(16.37)	31.37
95%	(15.28)	30.28
90%	(11.61)	26.61
75%	(5.87)	20.87
50%	(0.34)	15.34

Student's t Distribution		
Confidence Intervals	Bet = 1	
99%	(23.02)	38.02
98%	(19.98)	34.98
97%	(18.09)	33.09
96%	(16.68)	31.68
95%	(15.56)	30.56
90%	(11.79)	26.79
75%	(5.95)	20.95
50%	(0.37)	15.37

Hands Played	100

Profit Analysis	Per Hand	Per Session
E[Profit]	0.2500	25.0000
SD[Profit]	1.1710	11.7099

Probability of Profit	98.36%

Bootstrapping (200 samples)		
Confidence Intervals	Bet = 1	
99%	(1.02)	52.10
98%	1.71	50.50
97%	2.00	46.50
96%	4.60	46.36
95%	5.92	45.95
90%	7.81	43.38
75%	11.81	37.43
50%	17.87	32.50

Normal Distribution		
Confidence Intervals	Bet = 1	
99%	(5.16)	55.16
98%	(2.24)	52.24
97%	(0.41)	50.41
96%	0.95	49.05
95%	2.05	47.95
90%	5.74	44.26
75%	11.53	38.47
50%	17.10	32.90

Student's t Distribution		
Confidence Intervals	Bet = 1	
99%	(5.75)	55.75
98%	(2.69)	52.69
97%	(0.78)	50.78
96%	0.63	49.37
95%	1.77	48.23
90%	5.56	44.44
75%	11.45	38.55
50%	17.07	32.93

Section IV
d

Hands Played	200

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.0300)	(6.0000)
SD[Profit]	1.1182	15.8136

Probability of Profit	35.22%

Bootstrapping (200 samples)		
Confidence Intervals	Bet = 1	
99%	(45.18)	35.12
98%	(36.75)	32.26
97%	(34.70)	31.76
96%	(34.03)	28.73
95%	(33.25)	26.61
90%	(30.10)	21.37
75%	(23.01)	12.11
50%	(15.46)	5.19

Normal Distribution		
Confidence Intervals	Bet = 1	
99%	(46.73)	34.73
98%	(42.79)	30.79
97%	(40.32)	28.32
96%	(38.48)	26.48
95%	(36.99)	24.99
90%	(32.01)	20.01
75%	(24.19)	12.19
50%	(16.67)	4.67

Student's t Distribution		
Confidence Intervals	Bet = 1	
99%	(47.13)	35.13
98%	(43.09)	31.09
97%	(40.56)	28.56
96%	(38.69)	26.69
95%	(37.18)	25.18
90%	(32.13)	20.13
75%	(24.24)	12.24
50%	(16.69)	4.69

Hands Played	200

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.0050)	(1.0000)
SD[Profit]	1.1098	15.6916

Probability of Profit	47.46%

Confidence Intervals	Bet = 1	
99%	(47.49)	33.23
98%	(43.75)	30.89
97%	(37.25)	30.47
96%	(34.60)	29.75
95%	(33.03)	27.36
90%	(29.01)	22.13
75%	(18.10)	16.94
50%	(11.49)	10.88

Confidence Intervals	Bet = 1	
99%	(41.42)	39.42
98%	(37.50)	35.50
97%	(35.05)	33.05
96%	(33.23)	31.23
95%	(31.75)	29.75
90%	(26.81)	24.81
75%	(19.05)	17.05
50%	(11.58)	9.58

Confidence Intervals	Bet = 1	
99%	(41.81)	39.81
98%	(37.80)	35.80
97%	(35.30)	33.30
96%	(33.44)	31.44
95%	(31.94)	29.94
90%	(26.93)	24.93
75%	(19.10)	17.10
50%	(11.60)	9.60

Hands Played	200

Profit Analysis	Per Hand	Per Session
E[Profit]	0.0025	0.5000
SD[Profit]	1.0850	15.3436

Probability of Profit	51.30%

Confidence Intervals	Bet = 1	
99%	(35.01)	31.31
98%	(32.72)	30.93
97%	(29.70)	29.91
96%	(29.45)	29.91
95%	(28.28)	28.46
90%	(23.28)	25.06
75%	(17.36)	16.11
50%	(10.35)	10.29

Confidence Intervals	Bet = 1	
99%	(39.02)	40.02
98%	(35.19)	36.19
97%	(32.80)	33.80
96%	(31.01)	32.01
95%	(29.57)	30.57
90%	(24.74)	25.74
75%	(17.15)	18.15
50%	(9.85)	10.85

Confidence Intervals	Bet = 1	
99%	(39.40)	40.40
98%	(35.48)	36.48
97%	(33.04)	34.04
96%	(31.22)	32.22
95%	(29.76)	30.76
90%	(24.86)	25.86
75%	(17.20)	18.20
50%	(9.87)	10.87

Hands Played	200

Profit Analysis	Per Hand	Per Session
E[Profit]	0.0175	3.5000
SD[Profit]	1.1111	15.7138

Probability of Profit	58.51%

Confidence Intervals	Bet = 1	
99%	(24.20)	54.71
98%	(20.99)	44.85
97%	(20.84)	43.67
96%	(18.78)	43.51
95%	(18.07)	34.32
90%	(15.90)	26.68
75%	(9.48)	19.64
50%	(2.88)	14.61

Confidence Intervals	Bet = 1	
99%	(36.98)	43.98
98%	(33.06)	40.06
97%	(30.60)	37.60
96%	(28.77)	35.77
95%	(27.30)	34.30
90%	(22.35)	29.35
75%	(14.58)	21.58
50%	(7.10)	14.10

Confidence Intervals	Bet = 1	
99%	(37.37)	44.37
98%	(33.35)	40.35
97%	(30.85)	37.85
96%	(28.99)	35.99
95%	(27.49)	34.49
90%	(22.47)	29.47
75%	(14.63)	21.63
50%	(7.12)	14.12

Hands Played	200

Profit Analysis	Per Hand	Per Session
E[Profit]	0.0625	12.5000
SD[Profit]	1.1129	15.7387

Probability of Profit	78.69%

Confidence Intervals	Bet = 1	
99%	(21.90)	53.19
98%	(20.97)	51.17
97%	(18.92)	49.69
96%	(17.25)	48.61
95%	(16.97)	47.12
90%	(15.24)	41.10
75%	(4.19)	33.85
50%	3.23	23.95

Confidence Intervals	Bet = 1	
99%	(28.04)	53.04
98%	(24.11)	49.11
97%	(21.65)	46.65
96%	(19.82)	44.82
95%	(18.35)	43.35
90%	(13.39)	38.39
75%	(5.61)	30.61
50%	1.88	23.12

Confidence Intervals	Bet = 1	
99%	(28.43)	53.43
98%	(24.41)	49.41
97%	(21.90)	46.90
96%	(20.04)	45.04
95%	(18.54)	43.54
90%	(13.51)	38.51
75%	(5.66)	30.66
50%	1.86	23.14

Section IV

Normal Distribution	Student's t Distribution

Hands Played	500

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.0610)	(30.5000)
SD[Profit]	1.1186	25.0128

Probability of Profit	11.14%

Confidence Intervals	Bet = 1	
99%	(94.93)	33.93
98%	(88.69)	27.69
97%	(84.78)	23.78
96%	(81.87)	20.87
95%	(79.52)	18.52
90%	(71.64)	10.64
75%	(59.27)	(1.73)
50%	(47.37)	(13.63)

Confidence Intervals	Bet = 1	
99%	(95.18)	34.18
98%	(88.88)	27.88
97%	(84.94)	23.94
96%	(82.00)	21.00
95%	(79.64)	18.64
90%	(71.72)	10.72
75%	(59.31)	(1.69)
50%	(47.38)	(13.62)

Hands Played	500

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.0320)	(16.0000)
SD[Profit]	1.1002	24.6008

Probability of Profit	25.77%

Confidence Intervals	Bet = 1	
99%	(79.37)	47.37
98%	(73.23)	41.23
97%	(69.39)	37.39
96%	(66.52)	34.52
95%	(64.22)	32.22
90%	(56.46)	24.46
75%	(44.30)	12.30
50%	(32.59)	0.59

Confidence Intervals	Bet = 1	
99%	(79.61)	47.61
98%	(73.41)	41.41
97%	(69.54)	37.54
96%	(66.66)	34.66
95%	(64.33)	32.33
90%	(56.54)	24.54
75%	(44.33)	12.33
50%	(32.61)	0.61

Hands Played	500

Profit Analysis	Per Hand	Per Session
E[Profit]	0.02800	14.0000
SD[Profit]	1.12015	25.0472

Probability of Profit	71.19%

Confidence Intervals	Bet = 1	
99%	(50.52)	78.52
98%	(44.27)	72.27
97%	(40.35)	68.35
96%	(37.44)	65.44
95%	(35.09)	63.09
90%	(27.20)	55.20
75%	(14.81)	42.81
50%	(2.89)	30.89

Confidence Intervals	Bet = 1	
99%	(50.76)	78.76
98%	(44.46)	72.46
97%	(40.51)	68.51
96%	(37.58)	65.58
95%	(35.21)	63.21
90%	(27.28)	55.28
75%	(14.85)	42.85
50%	(2.91)	30.91

Hands Played	500

Profit Analysis	Per Hand	Per Session
E[Profit]	0.0280	14.0000
SD[Profit]	1.1125	24.8766

Probability of Profit	71.32%

Confidence Intervals	Bet = 1	
99%	(50.08)	78.08
98%	(43.87)	71.87
97%	(39.98)	67.98
96%	(37.09)	65.09
95%	(34.76)	62.76
90%	(26.92)	54.92
75%	(14.62)	42.62
50%	(2.78)	30.78

Confidence Intervals	Bet = 1	
99%	(50.32)	78.32
98%	(44.06)	72.06
97%	(40.14)	68.14
96%	(37.22)	65.22
95%	(34.88)	62.88
90%	(26.99)	54.99
75%	(14.65)	42.65
50%	(2.79)	30.79

Hands Played	500

Profit Analysis	Per Hand	Per Session
E[Profit]	0.0770	38.5000
SD[Profit]	1.1163	24.9606

Probability of Profit	93.85%

Confidence Intervals	Bet = 1	
99%	(25.79)	102.79
98%	(19.57)	96.57
97%	(15.67)	92.67
96%	(12.76)	89.76
95%	(10.42)	87.42
90%	(2.56)	79.56
75%	9.79	67.21
50%	21.66	55.34

Confidence Intervals	Bet = 1	
99%	(26.04)	103.04
98%	(19.75)	96.75
97%	(15.82)	92.82
96%	(12.90)	89.90
95%	(10.54)	87.54
90%	(2.63)	79.63
75%	9.75	67.25
50%	21.65	55.35

Section IV
f

Hands Played	1000

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.0830)	(83.0000)
SD[Profit]	1.0974	34.7032

Probability of Profit	0.84%

	Normal Distribution		Student's t Distribution	
Confidence Intervals	Bet = 1		Confidence Intervals	Bet = 1
99%	(172.39)	6.39	99%	(172.56) 6.56
98%	(163.73)	(2.27)	98%	(163.86) (2.14)
97%	(158.31)	(7.69)	97%	(158.42) (7.58)
96%	(154.27)	(11.73)	96%	(154.36) (11.64)
95%	(151.02)	(14.98)	95%	(151.10) (14.90)
90%	(140.08)	(25.92)	90%	(140.13) (25.87)
75%	(122.92)	(43.08)	75%	(122.94) (43.06)
50%	(106.41)	(59.59)	50%	(106.42) (59.58)

Hands Played	1000

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.0740)	(74.0000)
SD[Profit]	1.1044	34.9248

Probability of Profit	1.71%

Confidence Intervals	Bet = 1	
99%	(163.96)	15.96
98%	(155.25)	7.25
97%	(149.79)	1.79
96%	(145.73)	(2.27)
95%	(142.45)	(5.55)
90%	(131.45)	(16.55)
75%	(114.18)	(33.82)
50%	(97.56)	(50.44)

Confidence Intervals	Bet = 1	
99%	(164.13)	16.13
98%	(155.38)	7.38
97%	(149.90)	1.90
96%	(145.82)	(2.18)
95%	(142.53)	(5.47)
90%	(131.50)	(16.50)
75%	(114.20)	(33.80)
50%	(97.57)	(50.43)

Hands Played	1000

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.0510)	(51.0000)
SD[Profit]	1.1000	34.7866

Probability of Profit	7.13%

Confidence Intervals	Bet = 1	
99%	(140.60)	38.60
98%	(131.93)	29.93
97%	(126.49)	24.49
96%	(122.44)	20.44
95%	(119.18)	17.18
90%	(108.22)	6.22
75%	(91.02)	(10.98)
50%	(74.46)	(27.54)

Confidence Intervals	Bet = 1	
99%	(140.78)	38.78
98%	(132.06)	30.06
97%	(126.60)	24.60
96%	(122.54)	20.54
95%	(119.26)	17.26
90%	(108.27)	6.27
75%	(91.04)	(10.96)
50%	(74.47)	(27.53)

Hands Played	1000

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.0125)	(12.5000)
SD[Profit]	1.1211	35.4521

Probability of Profit	36.22%

Confidence Intervals	Bet = 1	
99%	(103.82)	78.82
98%	(94.97)	69.97
97%	(89.43)	64.43
96%	(85.31)	60.31
95%	(81.98)	56.98
90%	(70.81)	45.81
75%	(53.28)	28.28
50%	(36.41)	11.41

Confidence Intervals	Bet = 1	
99%	(103.99)	78.99
98%	(95.11)	70.11
97%	(89.54)	64.54
96%	(85.40)	60.40
95%	(82.07)	57.07
90%	(70.87)	45.87
75%	(53.31)	28.31
50%	(36.42)	11.42

Hands Played	1000

Profit Analysis	Per Hand	Per Session
E[Profit]	0.0160	16.0000
SD[Profit]	1.1189	35.3836

Probability of Profit	67.44%

Confidence Intervals	Bet = 1	
99%	(75.14)	107.14
98%	(66.31)	98.31
97%	(60.79)	92.79
96%	(56.67)	88.67
95%	(53.35)	85.35
90%	(42.20)	74.20
75%	(24.70)	56.70
50%	(7.87)	39.87

Confidence Intervals	Bet = 1	
99%	(75.32)	107.32
98%	(66.45)	98.45
97%	(60.90)	92.90
96%	(56.76)	88.76
95%	(53.43)	85.43
90%	(42.25)	74.25
75%	(24.73)	56.73
50%	(7.87)	39.87

Section IV
g

Hands Played	2500

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.0252)	(63.0000)
SD[Profit]	1.1015	55.0738

Probability of Profit	12.63%

	Normal Distribution		Student's t Distribution	
Confidence Intervals	Bet = 1		Confidence Intervals	Bet = 1	
99%	(204.86)	78.86	99%	(204.97)	78.97
98%	(191.12)	65.12	98%	(191.20)	65.20
97%	(182.52)	56.52	97%	(182.58)	56.58
96%	(176.11)	50.11	96%	(176.17)	50.17
95%	(170.94)	44.94	95%	(171.00)	45.00
90%	(153.59)	27.59	90%	(153.62)	27.62
75%	(126.35)	0.35	75%	(126.37)	0.37
50%	(100.15)	(25.85)	50%	(100.15)	(25.85)

Hands Played	2500

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.0066)	(16.5000)
SD[Profit]	1.0956	54.7799

Probability of Profit	36.16%

Confidence Intervals	Bet = 1	
99%	(157.60)	124.60
98%	(143.94)	110.94
97%	(135.38)	102.38
96%	(129.00)	96.00
95%	(123.87)	90.87
90%	(106.60)	73.60
75%	(79.52)	46.52
50%	(53.45)	20.45

Confidence Intervals	Bet = 1	
99%	(157.71)	124.71
98%	(144.02)	111.02
97%	(135.45)	102.45
96%	(129.06)	96.06
95%	(123.92)	90.92
90%	(106.64)	73.64
75%	(79.53)	46.53
50%	(53.45)	20.45

Hands Played	2500

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.0064)	(16.0000)
SD[Profit]	1.1199	55.9969

Probability of Profit	38.75%

Confidence Intervals	Bet = 1	
99%	(160.24)	128.24
98%	(146.27)	114.27
97%	(137.52)	105.52
96%	(131.00)	99.00
95%	(125.75)	93.75
90%	(108.11)	76.11
75%	(80.42)	48.42
50%	(53.77)	21.77

Confidence Intervals	Bet = 1	
99%	(160.35)	128.35
98%	(146.35)	114.35
97%	(137.59)	105.59
96%	(131.06)	99.06
95%	(125.81)	93.81
90%	(108.14)	76.14
75%	(80.43)	48.43
50%	(53.77)	21.77

Hands Played	2500

Profit Analysis	Per Hand	Per Session
E[Profit]	0.0108	27.0000
SD[Profit]	1.1101	55.5062

Probability of Profit	58.67%

Confidence Intervals	Bet = 1	
99%	(115.97)	169.97
98%	(102.13)	156.13
97%	(93.45)	147.45
96%	(87.00)	141.00
95%	(81.79)	135.79
90%	(64.30)	118.30
75%	(36.85)	90.85
50%	(10.44)	64.44

Confidence Intervals	Bet = 1	
99%	(116.08)	170.08
98%	(102.21)	156.21
97%	(93.52)	147.52
96%	(87.06)	141.06
95%	(81.84)	135.84
90%	(64.33)	118.33
75%	(36.87)	90.87
50%	(10.44)	64.44

Hands Played	2500

Profit Analysis	Per Hand	Per Session
E[Profit]	0.0140	35.0000
SD[Profit]	1.1006	55.0293

Probability of Profit	73.76%

Confidence Intervals	Bet = 1	
99%	(106.75)	176.75
98%	(93.02)	163.02
97%	(84.42)	154.42
96%	(78.02)	148.02
95%	(72.86)	142.86
90%	(55.52)	125.52
75%	(28.30)	98.30
50%	(2.12)	72.12

Confidence Intervals	Bet = 1	
99%	(106.85)	176.85
98%	(93.10)	163.10
97%	(84.49)	154.49
96%	(78.08)	148.08
95%	(72.91)	142.91
90%	(55.55)	125.55
75%	(28.32)	98.32
50%	(2.12)	72.12

Section IV
h

Hands Played	5000

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.0198)	(99.0000)
SD[Profit]	1.0949	77.4192

Probability of Profit	10.05%

	Normal Distribution		Student's t Distribution	
Confidence Intervals	Bet = 1		Bet = 1	
99%	(298.42)	100.42	(298.50)	100.50
98%	(279.10)	81.10	(279.16)	81.16
97%	(267.01)	69.01	(267.05)	69.05
96%	(258.00)	60.00	(258.04)	60.04
95%	(250.74)	52.74	(250.78)	52.78
90%	(226.34)	28.34	(226.37)	28.37
75%	(188.06)	(9.94)	(188.07)	(9.93)
50%	(151.22)	(46.78)	(151.22)	(46.78)

Hands Played	5000

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.0125)	(62.5000)
SD[Profit]	1.1070	78.2796

Probability of Profit	21.23%

Confidence Intervals	Bet = 1	
99%	(264.14)	139.14
98%	(244.61)	119.61
97%	(232.37)	107.37
96%	(223.27)	98.27
95%	(215.92)	90.92
90%	(191.26)	66.26
75%	(152.55)	27.55
50%	(115.30)	(9.70)

Confidence Intervals	Bet = 1	
99%	(264.21)	139.21
98%	(244.66)	119.66
97%	(232.42)	107.42
96%	(223.31)	98.31
95%	(215.96)	90.96
90%	(191.28)	66.28
75%	(152.56)	27.56
50%	(115.30)	(9.70)

Hands Played	5000

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.012)	(61.5000)
SD[Profit]	1.105	78.1103

Probability of Profit	21.55%

Confidence Intervals	Bet = 1	
99%	(262.70)	139.70
98%	(243.21)	120.21
97%	(231.01)	108.01
96%	(221.92)	98.92
95%	(214.59)	91.59
90%	(189.98)	66.98
75%	(151.35)	28.35
50%	(114.18)	(8.82)

Confidence Intervals	Bet = 1	
99%	(262.78)	139.78
98%	(243.27)	120.27
97%	(231.05)	108.05
96%	(221.96)	98.96
95%	(214.63)	91.63
90%	(190.00)	67.00
75%	(151.36)	28.36
50%	(114.19)	(8.81)

Hands Played	5000

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.0014)	(7.0000)
SD[Profit]	1.1148	78.8304

Probability of Profit	0.46462107

Confidence Intervals	Bet = 1	
99%	(210.05)	196.05
98%	(190.39)	176.39
97%	(178.07)	164.07
96%	(168.90)	154.90
95%	(161.50)	147.50
90%	(136.66)	122.66
75%	(97.68)	83.68
50%	(60.17)	46.17

Confidence Intervals	Bet = 1	
99%	(210.13)	196.13
98%	(190.45)	176.45
97%	(178.12)	164.12
96%	(168.94)	154.94
95%	(161.54)	147.54
90%	(136.69)	122.69
75%	(97.69)	83.69
50%	(60.17)	46.17

Hands Played	5000

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.0009)	(4.5000)
SD[Profit]	1.1134	78.7273

Probability of Profit	47.72%

Confidence Intervals	Bet = 1	
99%	(207.29)	198.29
98%	(187.65)	178.65
97%	(175.35)	166.35
96%	(166.19)	157.19
95%	(158.80)	149.80
90%	(133.99)	124.99
75%	(95.06)	86.06
50%	(57.60)	48.60

Confidence Intervals	Bet = 1	
99%	(207.37)	198.37
98%	(187.71)	178.71
97%	(175.39)	166.39
96%	(166.23)	157.23
95%	(158.84)	149.84
90%	(134.02)	125.02
75%	(95.07)	86.07
50%	(57.60)	48.60

Section IV
I

Hands Played	10000

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.0100)	(99.5000)
SD[Profit]	1.1077	110.7722

Probability of Profit	18.45%

Normal Distribution		
Confidence Intervals	Bet = 1	
99%	(384.83)	185.83
98%	(357.19)	158.19
97%	(339.89)	140.89
96%	(327.00)	128.00
95%	(316.61)	117.61
90%	(281.70)	82.70
75%	(226.93)	27.93
50%	(174.21)	(24.79)

Student's t Distribution		
Confidence Intervals	Bet = 1	
99%	(384.89)	185.89
98%	(357.24)	158.24
97%	(339.92)	140.92
96%	(327.03)	128.03
95%	(316.64)	117.64
90%	(281.72)	82.72
75%	(226.93)	27.93
50%	(174.22)	(24.78)

Hands Played	10000

Profit Analysis	Per Hand	Per Session
E[Profit]	(0.0064)	(64.0000)
SD[Profit]	1.1105	111.0510

Probability of Profit	28.22%

Confidence Intervals	Bet = 1	
99%	(350.05)	222.05
98%	(322.34)	194.34
97%	(304.99)	176.99
96%	(292.07)	164.07
95%	(281.66)	153.66
90%	(246.66)	118.66
75%	(191.75)	63.75
50%	(138.90)	10.90

Confidence Intervals	Bet = 1	
99%	(350.10)	222.10
98%	(322.39)	194.39
97%	(305.03)	177.03
96%	(292.10)	164.10
95%	(281.68)	153.68
90%	(246.68)	118.68
75%	(191.75)	63.75
50%	(138.91)	10.91

Hands Played	10000

Profit Analysis	Per Hand	Per Session
E[Profit]	0.0014	14.0000
SD[Profit]	1.1076	110.7552

Probability of Profit	56.69%

Confidence Intervals	Bet = 1	
99%	(271.29)	299.29
98%	(243.65)	271.65
97%	(226.35)	254.35
96%	(213.46)	241.46
95%	(203.08)	231.08
90%	(168.18)	196.18
75%	(113.41)	141.41
50%	(60.70)	88.70

Confidence Intervals	Bet = 1	
99%	(271.34)	299.34
98%	(243.70)	271.70
97%	(226.38)	254.38
96%	(213.49)	241.49
95%	(203.10)	231.10
90%	(168.19)	196.19
75%	(113.41)	141.41
50%	(60.71)	88.71

Hands Played	10000

Profit Analysis	Per Hand	Per Session
E[Profit]	0.0127	127.0000
SD[Profit]	1.1002	110.0164

Probability of Profit	87.58%

Confidence Intervals	Bet = 1	
99%	(156.38)	410.38
98%	(128.94)	382.94
97%	(111.75)	365.75
96%	(98.95)	352.95
95%	(88.63)	342.63
90%	(53.96)	307.96
75%	0.44	253.56
50%	52.80	201.20

Confidence Intervals	Bet = 1	
99%	(156.44)	410.44
98%	(128.98)	382.98
97%	(111.78)	365.78
96%	(98.98)	352.98
95%	(88.65)	342.65
90%	(53.98)	307.98
75%	0.44	253.56
50%	52.79	201.21

Hands Played	10000

Profit Analysis	Per Hand	Per Session
E[Profit]	0.0307	307.0000
SD[Profit]	1.1101	111.0059

Probability of Profit	99.72%

Confidence Intervals	Bet = 1	
99%	21.07	592.93
98%	48.76	565.24
97%	66.11	547.89
96%	79.02	534.98
95%	89.43	524.57
90%	124.41	489.59
75%	179.30	434.70
50%	232.13	381.87

Confidence Intervals	Bet = 1	
99%	21.01	592.99
98%	48.72	565.28
97%	66.07	547.93
96%	78.99	535.01
95%	89.41	524.59
90%	124.39	489.61
75%	179.30	434.70
50%	232.12	381.88